

# LAWRENCE LIVERMORE REPORT

**A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, April 4-8, 2011**

## A supercomputer's psychiatrist



### Computation employees make adjustments to the Hyperion testbed.

Similar to how anti-virus software searches for suspicious content, Laboratory researchers are using supercomputers to look for suspicious behavior -- sort of how a psychiatrist peeks into the psyches of its patients.

Instead of monitoring content, the LLNL researchers monitor behavior in hopes of discovering the "fingerprint" of hackers. If a computer starts to behave suspiciously, they pull its plug to the network.

The technology relies on an agent on every desktop -- a tiny, almost invisible application that takes up almost no memory and acts as a digital "psychiatrist." It uses techniques developed by LLNL's Celeste Matarazzo and fellow scientists, on a Livermore supercomputer to build a software model of the activity of all the Lab's 40,000 unclassified computers.

The Lab is sharing its application with the private sector for use by the public.

To see the video, go to the [Web](#).

## Cleaning our room



Everyone knows that when you're a kid, cleaning your room is real drag. It takes time away from fun things and doesn't change the functionality of the room other than it being a bit cleaner.

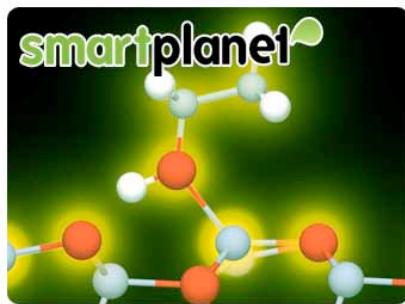
In a recent article in *The Atlantic*, LLNL's Carbon Management Leader Julio Friedmann expounds on how saving the planet is just like "cleaning our room."

He says, "Changing human behavior, even for near-term tangible benefits, can be very hard. Reducing greenhouse gas emissions is much harder."

The benefits of reduced emissions and clean energy, no matter how vital and real, are hard to see. They occur in the future, typically are costly, are globally dispersed, and are hotly contested. While the possible, even likely loss of polar ecosystems and Himalayan glaciers is frightening to those who study and understand them, few actually understand the potential impacts and even fewer have seen these things, Friedman writes.

To read the full article, go to the [Web](#).

### Look Ma, no batteries



**A battery-less chemical sensor relies on interactions of molecules with semiconductor nanowires.**

Unlike many conventional chemical detectors that require an external power source, Laboratory researchers have developed a nanosensor that relies on semiconductor nanowires, rather than traditional batteries.

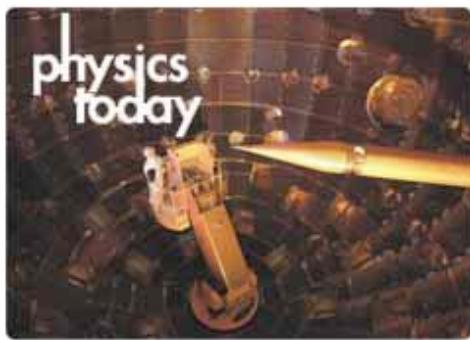
The device overcomes the power requirement of traditional sensors and is simple, highly sensitive and can detect various molecules quickly. Its development could be the first step in making an easily deployable chemical sensor for the battlefield.

The Lab's Yinmin "Morris" Wang and colleagues, along with collaborators from the University of Shanghai for Science and Technology, have fabricated the first-generation battery-less detectors that use one-dimensional semiconductor nanowires.

The chemical detector gets a charge when electrical voltages are produced on semiconductor nanowires in solution.

To read more, go to the [Web](#).

### Betting on a clean energy source



### Inside the NIF target chamber, where fusion ignition is expected to become a reality.

Within the next two years, physicists are expecting to achieve what many call the mecca of fusion energy: ignition and high energy gain at the Lab's National Ignition Facility.

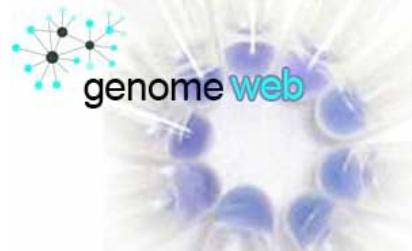
In the quest to develop nuclear fusion as a bountiful source of clean energy, the inertial confinement route uses high-powered lasers to implode tiny capsules of fuel to fuse heavy isotopes of hydrogen. Inertial confinement fusion (ICF) has been advanced primarily for its military applications, because it can simulate in the laboratory some of the processes that occur in the fusion stage of thermonuclear weapons.

Scientists are experimenting in earnest toward their goal of achieving ignition and high gain at NIF. If they are successful, for the first time in more than 50 years of ICF research, experimenters will get more energy from the fusion reaction than they put in to produce it. Already, scientists and engineers have begun to reexamine the possibility that ICF might offer a quicker path to fusion energy.

At the request of Steven Koonin, DOE undersecretary for science, a National Research Council (NRC) committee is looking at inertial fusion energy (IFE) and will advise how soon and at what cost the required technologies could be developed.

To read more, go to the [Web](#).

#### **Looking for a partner at the point of care**



#### **A point-of-care testing device can be used to test for infectious diseases**

While science has simplified tests for pregnancy, glucose, drugs of abuse and other protein biomarkers, testing for infectious diseases has been more difficult. Such testing requires Polymerase Chain Reaction (PCR)-based assays for analysis of nucleic acids, while PCR itself requires highly purified samples as well as complex instrumentation for detection of fluorescent tags.

Now laboratory researchers have developed a point-of-care testing device and assay conditions for infectious diseases. The device is simplified in its design, allowing sample acquisition, preparation, nucleic acid amplification and detection all in one tube.

LLNL is looking for industry partners to license and develop the device, which could enable ultra-fast and inexpensive infectious disease testing in the human and veterinary medicine markets.

To read more, go to the [Web](#).

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail <mailto:labreport@llnl.gov>.

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